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Valuation of Prospects

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VALUATION OF PROSPECTS.

BY GEORGE R. FANSETT

There is no line of business in the world where greater differences of opinion are found than in the calculation of a prospect. This is due not only to the lack of definite information on which the valuation can be based, but also to differences in the experiences and attitudes of the different ones making the valuation.

According to H. C. Hoover, in his excellent work entitled "Principles of Mining," the calculation of copper, gold, silver, tin, lead, zinc Lode Mines are dependent upon the following features:

- (a) The profit that can be won from the ore exposed.
- (b) The prospective profit to be derived from extensions of the ore beyond exposures.
- (c) The effect of a higher or lower price of the metal (except in gold mines).
- (d) The efficiency of the management during realization.

The first of these may be termed the positive value and can be approximately determined by sampling or test treatment runs. The second and third may be termed the speculative values and are largely a matter of judgment, based on the geological evidence and the industrial outlook. The fourth is a question of development, equipment, and engineering method adapted to the prospects of the enterprise, together with capable executive control of these works.

Defined in the mining world, prospects are usually newly discovered properties or re-opened old mines where there is very little if any positive or very developed ore (ore exposed on all four sides in blocks of reasonable size) or very little if any of the so-called blocked out ore (ore exposed on three sides, all of these sides being within a reasonable distance from each other.) Therefore a prospect usually has no tonnage of ore on which an estimate of assured profits can be based. For this reason subdivision (a) of Mr. Hoover's table plays very little if any part in the valuation of a prospect, which, therefore, is dependent on the speculative divisions (b) and (c) and the last subdivision (d) of his table.

Since this is the case, and as no man can look very far into the ground, the only factors upon which the valuation can be based are the geological evidence and the industrial outlook presented. Here is where the experience and personal attitude of the different ones

making the valuation come in. We find for the same prospect many valuations, ranging from that given by the optimistic prospector or owner, who is positive that he has a million-dollar proposition, to that of the prospective purchaser whose engineer has inspected the property and has either found very little data on which to base an opinion, or who may believe in giving a very conservative opinion, in order to side-step his responsibility to his employer, or, as he may suppose, to protect his reputation. Both of these extremes are naturally undesirable, since either one will produce inaction, the result being that nothing is done with the property. If the owner were more experienced he could easily see that with the data available on which to form an opinion, the property will not bring his price as a gamble, to say nothing of a fair business proposition. On the other hand, if the engineer had taken into consideration other factors available, his opinion may have been more favorable, the two parties to come to terms and perhaps permitting of the active development of a producing mine.

The qualifications for a man in this line of work are very broad. He should have a thorough theoretical training as well as practical experience in mining engineering, and should also be familiar with geological, metallurgical and electrical engineering. In addition to this he should be a wide-awake business man, with good hard, common sense, one who makes up his mind and forms definite opinions from the facts available, and who will allow no personal feeling or sentiment to bias him in his final judgment of the case.

"Hunches" are commonly supposed to be the basis for most opinions on a prospect, and to the uninitiated it often seems that they are responsible for the purchase of certain properties which have turned out to be big paying propositions. Luck also is credited with a great deal of this success, but in most cases where the hunches or luck has turned out to so good advantage it is noticeable that the man who did the buying with these factors in his favor was usually a thoroughly experienced man, with keen perception and good judgment, who knew the earmarks of a mine when he saw them. He is usually one who has spent years in and around mines, and had made good use of his time and eyes in observing the points which go to make up a mine. Likewise he is willing to back his judgment with all the money he has available, and for that reason may be considered of an adventurous nature. He usually has a working knowledge of mining geology, and is particularly well posted on outcrops and surface showings and what they have led to in other mines which have been developed. From this experience he is able to reason out what might

naturally be expected if the prospect is opened up in depth, and for that reason is in a good position to handle the matter intelligently, and with assurance, where otherwise it would appear as an absolutely foolhardy undertaking.

Since the surface showings of a deposit or the outcrop of a prospect play so important a part it seems advisable that a few suggestions along this line be mentioned.

In practically all cases the vein or ore body is made up of different rocks and minerals than that of the country rock surrounding it. This being the case, it usually has a different color than the country rock, which difference of color can be noticed from a distance when not apparent at short range. Also the vegetation covering the district may have a slightly different shade where it grows on or close to the deposit from that growing on the country rock.

One of the most common indications of outcrops is the different rate of weathering of the country rock and the rocks or minerals making up the outcrop, due to the difference in composition. For example, a thick, hard, slow-weathering quartz vein in contact-metamorphic deposits will appear after long weathering as small ridges or knobs above the general level of a softer, quicker weathering country rock, and can often be traced very easily along its surface.

Where the minerals making up the deposit are more easily eroded than the country rock surrounding it, the reverse is true, and instead of a ridge, a depression or gully marks the deposit.

Some of the geological factors which have more or less influence on the valuation are surface indications, such as the commonly known "iron cap," iron-stained honeycombed vein matter or heavily iron-stained disintegrated gossan. These indicate that the vein matter before erosion contained iron as pyrites or in some other form, with possibly other valuable minerals; upon weathering these broke down, the gangue being carried away (chemically), stained the outcrop the characteristic iron rust color. Since most of the large mines of the world have been found under or as extensions of outcrops so colored, the prospectors look very favorably upon these factors as good indications of mineral.

Likewise if the iron-stained disintegrated is in contact-metamorphic deposit, it indicates that there may have been values of more easily leached metals present, such as copper, which were leached out as the outcrop weathered and eroded, carried down in solution and re-deposited at a lower level. The concentration of values accomplished by this action produces what is commonly known as a zone of secondary enrichment, and this is the part of the deposit where the

best values are found usually. This zone of secondary enrichment extends to the permanent water level, and the depth and values found in it depend not only upon the values which were present in the original ore body, but also on the efficiency of the action which accomplished the concentration of values.

Another good indication for a copper deposit is a surface showing heavily stained with copper carbonate. This, like the above, may reasonably be assumed to indicate that the values in copper will improve with depth. The stain indicates that copper is present and was probably originally present in the form of sulphides which have weathered to carbonates or some other soluble form. These soluble copper salts are taken up in solution in the same manner as explained above.

Below the permanent water level is the zone of unaltered primary sulphides, where the copper minerals exist as they were originally deposited, and therefore are usually of lower value than the enriched secondary sulphides of the deposit. For this reason the distance from the top of the secondary sulphides to the permanent water level is important.

Phyllite schists, as found in and around Jerome and Humboldt, represent another form of outcrop below which copper in commercial quantities is found at depth. The same theory of deposition applies to these deposits as for the above mentioned deposits, except that in some of these there are found patches of primary sulphides above or mixed with the secondary sulphides. This is due to the fact that the solutions carrying the copper values down passed through the cracks of the schist and did not come in direct contact with the primary sulphides found in these patches. In this way they were not acted upon by the solutions, but remained in their original form. It will be seen that deposits of minerals such as copper, which are easily leached and precipitated out of solutions at a lower depth, thus being concentrated and forming a zone of secondary enrichment, are looked upon as better risks than deposits of slow-leaching minerals, such as gold. The only concentration of values which takes place in a deposit of slow-leaching mineral is that due to the weathering and erosion of the surface and the consequent concentration of the mineral at or near the surface, due only to its specific gravity. This concentration is produced by the removal by rain or wind of the eroded gangue minerals, leaving behind the valuable mineral which is too heavy to be transported. This is obviously a most inefficient method of concentration, the greater part of the valuable mineral usually being washed or blown away along with the gangue. By

this agency the enrichment, if any takes place, is only on the surface of the deposit, and any increase in the values below the surface will only be those originally deposited there.

For these reasons very few engineers will advise the expenditure of much money in the development of properties other than copper or minerals of similar characteristics, when the openings are in mineral below commercial grade. When it is advised, in the case of slow-leaching minerals, it is because the engineer believes that lower down the values were originally more richly deposited.

In the case of most copper properties, where the surface showings are favorable, it is very seldom that commercial mineral is developed until the zone of secondary enrichment has been reached, and this is always at some depth. For that reason copper properties with good surface indications, although no ore may be usually in sight, represent a good prospect.

Large bodies of low-grade ore can be estimated much closer than those in which the mineral occurs in bunches or pockets of high grade, not only because they can be prospected satisfactorily and at a low cost with churn or diamond drills, but also because they can be expected to continue in value and quantity.

Fissure deposits, perhaps more than those of any other character, offer considerable data for a fairly definite estimate of the depth to which they can be expected to go. It has been found in the opening up and development of these deposits that the depth to which they extend has some relation to the length of the deposit. This relation, as commonly found by engineers, is a ratio of about 1 to 1; in other words, if the deposit is 500 feet long, the vein may reasonably be expected to extend to a depth of about 500 feet. As far as has been determined the width of the ore body has no relation to the length or depth of the deposit. This suggestion, however, as well as any of the foregoing, cannot be considered a hard and fast rule, and for that reason should be used with discretion.

The task of valuation of a property would be easy if all surface showings or outcrops which resemble those of a producing mine positively indicated the same mineral content, tonnage and other factors as in the producing mine which they resemble, but if exceptions are considered as proving any rule, the exceptions to this rule would prove it oftener than the examples which are found agreeing with it. In other words, although the majority of producing mines do have outcrops or surface showings which are comparatively similar in their respective classes, it does not mean that a prospect having similar surface showings will necessarily develop into a producing

mine. The common saying among miners that "all the rocks necessary to make a mine are present, but very little, if any, mineral is present," is only too true, and it is this factor which makes it difficult for any two men to form the same estimate of a prospect; the valuation may range from zero to a bonanza.

This is particularly true with prospects which are located in regions where there has never been a producing mine developed, when nothing but the geological factors can be considered. If, on the other hand, there are mines which have produced or are producing near at hand in that section the task of valuation is much simplified, providing the prospect lies in the same zone and has the same geological features as that of the producing mine. Much data from the developed mine can be used in helping to form an opinion of the prospect, and, as is commonly known, this fact has been responsible for the purchase and development of some of the largest mines of the world.

The above represent some of the geological factors which may aid in forming an opinion of a prospect, and are of particular service to an experienced man who has learned them on the ground around producing mines, where the gradual changes in the ore bodies from the surface down are visible, permitting of a thorough inspection of them. When studied in this way, they are seldom forgotten and are a great aid to the engineer should he see an outcrop whose geological features are similar to that of a producing mine with which he is acquainted.

Since the valuation of a prospect usually depends upon the value of the ore at or near the surface more than upon any other factor, the first thing to be done after a careful inspection of all exposed parts of the deposit has been made is the taking of samples. The method used and the handling of the samples after they have been taken before they are assayed, as well as the method used for measuring the width of the vein, were explained in Bulletins 63 and 66 of the Arizona State Bureau of Mines.

The values obtained from the assays of these samples are used for making the calculations for the estimate, and for this reason each sample, when assayed, should be run either duplicate or triplicate, so as to eliminate any chances of error which might arise.

At the time the samples are being taken it is good policy to take specimens of the rocks from the outcrop and from the surrounding rocks as well as the country rock. These are later used to make a study of the geology of the property, to determine the manner of ore deposition.

The deposit is also surveyed at this time, a map being made from the survey to be used for recording the locations and values obtained from the assays of the samples.

If favorable results have been obtained from the assays, indicating that the prospect is worth further attention, it is then advisable to have complete chemical and metallurgical analyses run on the samples, to determine if any unexpected valuable minerals are present and if the ore is amenable to reduction or treatment by the common or known processes at a price which will allow the ore to be handled at a profit. This is very important, as often the values obtained from the ordinary assays may be high enough to indicate a bonanza, but when subjected to these tests the treatment may be found to be so difficult or expensive that at the time the tests are run the ore may be practically valueless. Likewise from these tests the kind of treatment, the machinery and equipment necessary for doing the work can be determined and a close estimate of their cost can be made. All of these matters have considerable bearing on the valuation and most certainly should be taken into consideration to prevent costly mistakes.

The above represent some of the factors which are considered to have a direct bearing upon the valuation of a prospect, but in the last few years Mr. Hoover's table, section (c), has played a very important part in the history of many prospects. This stated above is an important part in the history of many prospects. The valuation of many prospects of tungsten, molybdenum and practically all of the other useful minerals has greatly increased with the high prices of metals and there has been opened up and developed many producing mines which before the raise in prices were considered of small value. In other words, the price of metals has a big influence on the value of prospects, and for that reason engineers should keep posted on the latest prices of the metals and the conditions of the market.

If, in the judgment of the party making the valuation, the property offers sufficiently favorable evidence for further investigation factors which are of a more certain and definite nature are then taken into consideration; the costs of the necessary equipment, machinery, buildings, tools, supplies and other necessities along this line can be fairly closely estimated. A close study of the water, fuel, timber, transportation, climatic and health conditions should be made, as well as an investigation of the government and local governmental regulations and the rigidity with which they are enforced. The costs of erecting the necessary machinery, timbering, mining, road building, the supply and kind of labor available for this work, as

well as the kind of management which is expected to handle the development, represent a few of the different matters which have to be taken into consideration, all of which have more or less bearing on the success of the enterprise, and which if not duly considered, may make a poor investment appear like a particularly good one.

To handle this work satisfactorily a man should have a good theoretical training, supplemented by broad practical experience. He should have at his finger ends the data on all matters relating to the administration of mines that he may be able to fairly draw close and safe conclusions from evidence at hand. Without this as a foundation he may have the "hunch," which, if he follows it, may prove disastrous for the purchaser.

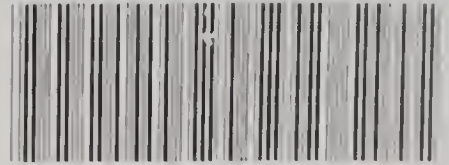
From the above it can be seen that the valuation of a prospect is not an easy or a certain proposition. It must not be assumed, however, from the foregoing remarks, that money put into a prospect is a poor investment, but, as in all other lines of business, one should either be personally experienced and back his own judgment or have in his employ experienced men upon whom he can depend and in whom he has absolute confidence both as to their integrity and ability. Otherwise he may be considered as taking a gambling chance, with the odds against him.

When handled in the proper manner there is perhaps no line of business which offers and has actually delivered such large returns on the initial investments as in successfully developed prospects, and where the same amount of personal attention and experience has been used as is necessary in any other line of business, the failures have been comparatively few. As a proof of this statement it is only necessary to look over the list of the fortunes in this country and see which of them were originally founded on an investment in a prospect, and it will generally be noticed that the man who made the original investment which turned out so favorably was a personally experienced mining man or was directly connected with experienced mining men, making use of their knowledge and suggestions. This can also be proved by the fact that one of the main departments of most of the large mining corporations is devoted to the search and development of prospects, and thousands of dollars are spent by them in this work. Through it there have been developed a large number of producing mines whose values far exceed the cost spent in finding and developing them.

It must also be said that an investment made in a proposition having the risk attached to it which the investment in many prospects has, the returns on the money should be expected to be more than

ordinary interest. It should return to the investor a rate which is proportional to the risk which is assumed. In other words, if a man has a prospect, which in no way can be called a mine, owing to the lack of definite information from which any profits can be calculated, his proposition to the investor should be in proportion to the risk assumed by the investor, and the price as set must be low enough so that it will interest the investor from the purely business standpoint, and optimism should not be capitalized by the prospector in putting a valuation upon his property.

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